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Determination of Characteristic Ceramic Membrane Support Alumina Silica with Using X-Ray Diffraction

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ABSTRACT

Base on materials contain of inorganic membrane can be divided to become ceramic membrane, glass membrane, metal membrane, and zeolite membrane. Ceramic membrane can be made through some ways, that is slip casting, trach-etch, and sol-gel. Process at this research use technique of sol-gel. In process sol-gel have excellence process compared to other separate process that is formed uniform pore to influence membrane performance. the purpose of this research is to determine existing rate and content in ceramic mebran of silica alumina support which making with technique of sol-gel. the research Variable of ceramic Membrane support the made is % WA (Water absorbtion) that is 7 % and 10%.. Ceramic membrane composition support have fixed with % absorbtion water, of the size diameter 5 cm and thick 3 mm. the product of membrane to be analysed its content with X-Ray Diffraction. From result of analysis known that Content of Sio2 to 10% WA is 74.605% bigger than ceramic 7% WA that is 62.91.

Keywords : ceramic membran support; technique of sol-gel; X-Ray Diffractions

1. INTRODUCTION

In the Last some years, developing of ceramic membrane start fast at various dissociation process and is condensed. Ceramic membrane have excellence of polymer membrane, among others stability of and thermal of kimiawi high . With that excellence , ceramic membrane earn application at environment have high temperature like at membrane reactor and permeasi of gas.

Some ceramic membrane which have been recognized in this time [is] to membrane of alumina , silica, titania, and zirkonia. Among of fourth membrane, membrane of alumina measure up to stability of termal, hidrotermal, and high mechanic, though its pore size measure big enough . For process needing smaller pore size measure , membrane of alumina arranged in layers with other membrane , like membrane of silica or zirkonia.

In general , ceramic membrane have the nature of barst easy to , so that to overcoming it enhanced by gluten of organic (binder). Gluten here function to fasten gel particles become stronger and meeting, so that can lessen forming of break. used glue must have to the high power of and easy to hydrolysis in water.

Some research about ceramic membrane which have been done by :

1. Asaeda,Masashi and Dinh Du, Luong (1986) Process dissociation of methanol (1)/ water (2) , ethanol (1)/ water (2) , isopropanol (1)/ water (2) in gas phase and result indicate that efficient ceramic membrane good enough to through Azeotropes in mixture of alcohol-water.
2. Sakohara,Shuji,Dkk (1990) , about dissociation of mixture of acetone(1) / air(2) by using ceramic membrane silica-alumina with Acrylamide kopolimer as primary monomer and of N,N'-Methylene-Bis(Acrylamide) as agent croslinking indicate that pervaporasi give big enoughly fluk irrigate with high concentration of acetone in side of upstream.
3. Li Shi (1999), about Influence of addition of glue to forming of alumina, mentioning that addition of PVA , PVAC, and PEG with each concentration 2% b / b. Its result that PVA have the power of to glue compared to higher than other.
4. Kartohardjono,S (2000), about dissociation of gas CO2 from the air with ceramic membrane which indicate that ceramic membrane can degrade concentration of CO2 in air.
5. Rina Wahyuningsih (2001) about Influence Of Addition Of Polivinil Alcohol To Forming - Made Alumina With Technique Sole - Gel. result show ever greaterly addition of PVA hence smaller % dry dwindling , and % dwindle burning was improved.

1.1 The Making Of Ceramic Membrane

Ceramic Membrane can be made by some ways , among others Slip Casting, Track-Etch, and sol-gel. At sol-gel have excellence process compared to other process namely forming of uniform pore pore, can be done at low temperature, formed membrane have high perity and homogeneity and existence of control to reaction that happened chemically.

Sole gel process which in fact happened very complicated, but simply can be divided to become 3 step that is :

1. Polymerize And Hydrolysis.

This Process happened by hydrolysis process and polymerize metal of Alkoksida in Solution. Reaction of hydrolysis in acid solution can take place very quickly. In general yielded by technological sole - gel in acid solution usually yield linear polymer and polymer branch. Generally ceramic membrane measure up to stability of low mechanic so that after draining phase and of kalsinasi barst. To overcoming it usually into enhanced by wet gel organic additive like alcohol polivinil, acetate polivinil of polietilen glikol, or acrylic polimetil.

2. Draining of Gel

Process draining can be conducted by certain temperature during, and can ce conducted with raising the temperature slowly with certain speed . besides draining can be conducted in so many atmosphere like air, nitrogen, and aqueous vapour.

3. Dry Calcination Gel

Calcination represented the process of solid by using high temperature so that happened change of structure and also composition of solid. process of calcinations this will yield a solid having high crystal structure. One of the process of Calcination by using furnace.

There is two kinds of membrane type of ceramic marginally if seen from way of its is namely ceramic membrane conventional type and modern ceramic membrane type (advance of ceramic) difference between both types of the membrane there is or there isn't impuritis in membrane. In modern ceramic membrane represent pure materials of Alumina and silica by 0 % impuritis while conventional membrane on the contrary still contain impuritis among FeS, Mgo, Cao, Fe2O3 with rate below/under 3 % (Norton, 1957) At this research will be made ceramic membrane silica alumina conventionally by using Clay, Feldspar and Kaolin as source of Alumina and silica with rate as according to absorbsi water .

During process combustion of this impuritis experience of reaction of which later will yield pore. Theability of membrane body in permeating water can be expressed with % WA with formula

$$\%WA = \frac{Wet\ weight - dry\ weight}{dry\ weight} x100\%$$

The Percent of WA influence the pore distribution (A. Briam,2001).

Steps Combustion is :

- Dried for sending out the water
- burned Organic materials
- Ceramic change
- Carbon and sulphur burning "
- Vitrifikation

Step - step above accompanied with existence of reaction of for example like tables 1 :

Tables of 1. 1 Reaction at process of firing

$FeS_2 + O_2 \longrightarrow FeS + SO_2$	350 – 450 ^0C
$\longrightarrow 4FeS + 7\ O_2$ $2Fe2S_3 + 4\ SO_2$	500 – 800 ^0C
$\longrightarrow C + O_2 \quad CO_2$	>> 350^0C
$\longrightarrow CaSO_4 \quad CaO + SO_3$	1200 – 1250 ^0C

2. METHODOLOGY OF RESEARCH

Raw Material : Clay, feldspar, kaolin, water.

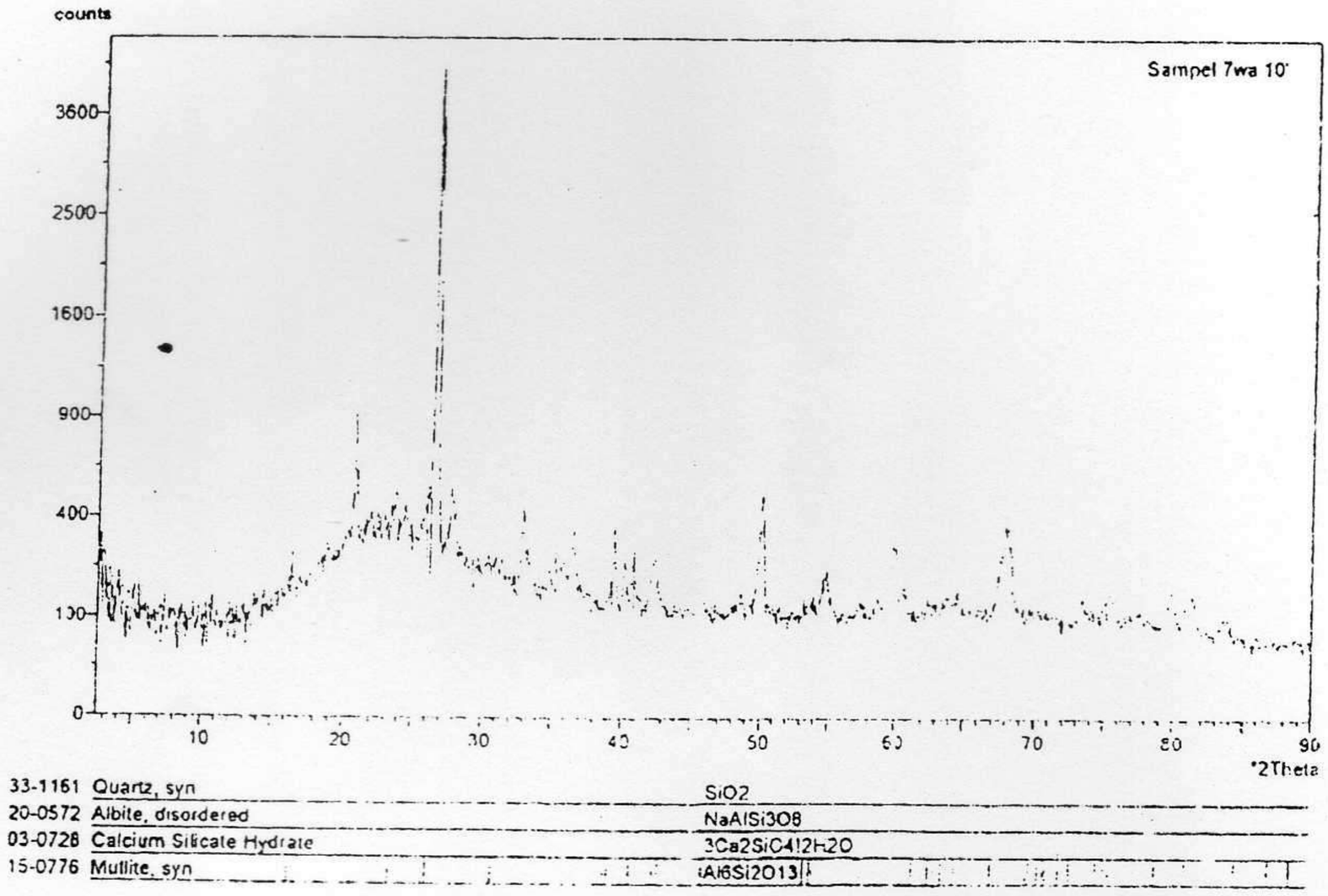
Variable : WA Membrane of support ceramic 7% and 10 %

Procedure

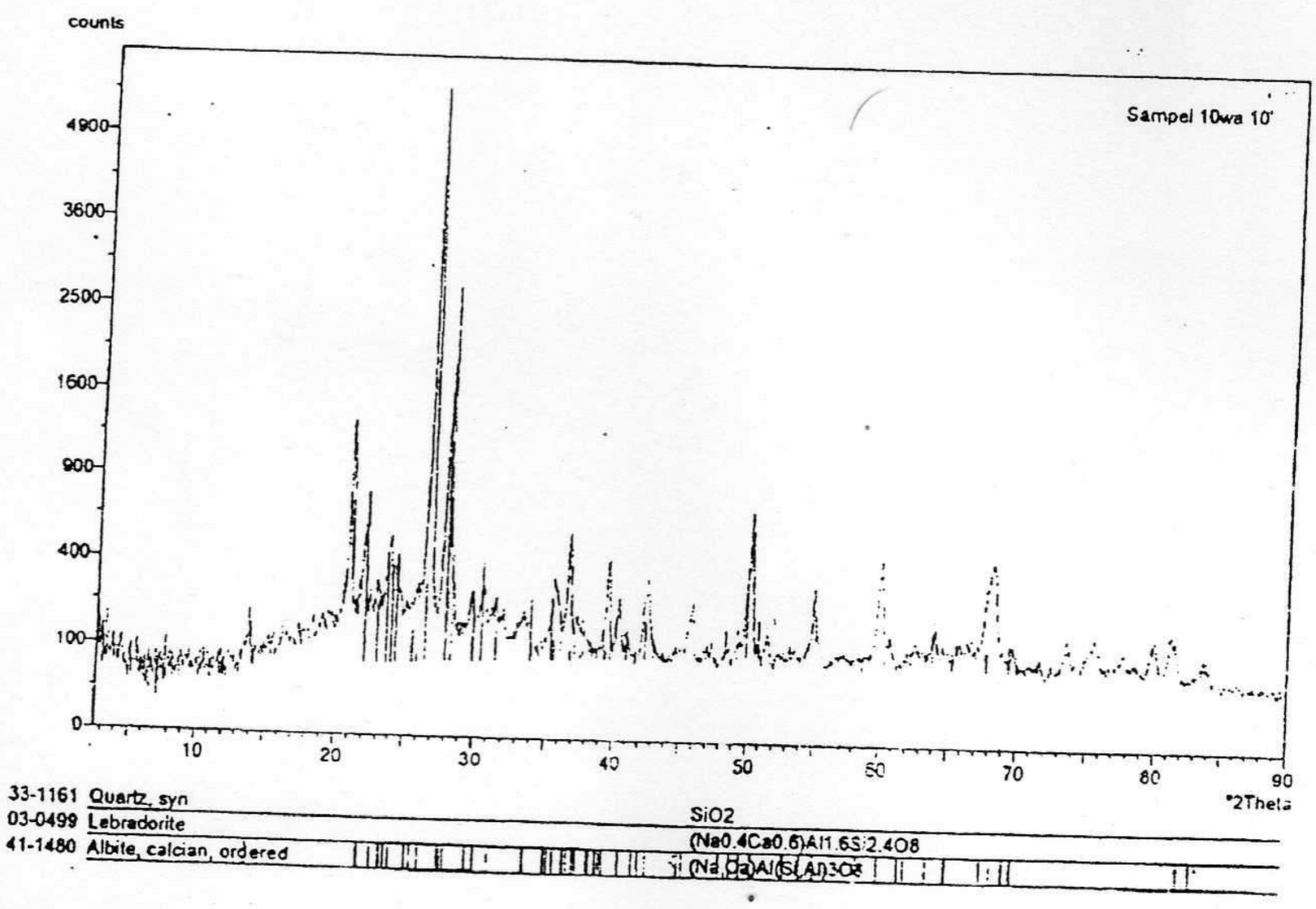
Membrane of Support 7% WA made by grinding the Clay (.25%), feldspar (70%), kaolin (5%) while for the 10% WA by grinding Clay (28%), feldspar (65%), kaolin (7%) .then mixed with water (rate irrigate 40%) till formed slurry . slurry dried with dryer spray formed flour (rate irrigate 6%) ,then pressing with pressure 340 kg / cm2, heated at temperature 1190^{0}C during 40 minute.

Ceramic which yielded will be printing and grinding , then formed to the size diameter 5 cm and thick 3 mm. Later this Membrane analyzed with X-Ray Diffraction

3. RESULT AND DISCUSSION



Graph 1.1 result of analysis of X-Ray ceramic Difraction membrane support 7% WA



Graph 1.2 result of analysis of X-Ray ceramic Difraction membrane support 10 % WA "

3.1 Discussion

Characteristic of Silica alumina in ceramic membrane can be analysed with X-ray faction to be able to identify silica and alumina. Respective their especially crystalized. From analysis of X-Rd can be estimated there are some component in ceramic membrane namely

- Quartz (Sio2)
- Albite (Na (Si3Al)O8)
- Labradorite (Na2O ! 2CaO ! 3Al2O3! 8SiO2)
- Mullite (Al6Si2O13)
- Calsium Magnesium Aluminium of Sil (Ca-Mg-Al-Si-O)
- Silimanite (Al2Sio5)
- Calcium Silicate of Hydrat (3Ca2SiO4!2H2O)
- Calcium Aluminium Sulfide of Hydrat (Ca6Al2S3O15!33H2O)
- Calcium Aluminium Silicate (Al3Cao.5Si3O11)

From both membrane can be seen that both having content which much the same to so that the both membrane can be use for process.

4. CONCLUSION

1 Knowing that ceramic membrane content of support is Quartz, Albite Labradorite , Mullite , Calsium Magnesium Aluminium of Sil , Silimanite , Calcium Silicate of Hydrat , Calcium Aluminium Sulfide of Hydrat , Calcium Aluminium Silicate.

2. Knowable the composition maker of ceramic membrane support is clay, kaolin and feldspar according to % Its WA.
3. % WA not many influence in ceramic membrane content of support.

5. SUGGESTION

1. Require to the next reserch conducted to modification the support material.
2. To the next research for the application of ceramic to membrane support.

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